AN EVALUATION OF BOCA RATON FIRE-RESCUE'S SMART HEART COMMUNITY BLOOD CHOLESTEROL ANALYSIS PROGRAM

STRATIGIC ANALYSIS OF COMMUNITY RISK REDUCTION

BY: Bruce D. Angier
Battalion Chief
Boca Raton Fire-Rescue Services
Boca Raton, Florida

An applied research project submitted to the National Fire Academy
as part of the Executive Fire Officer Program

October 2002

ABSTRACT

This research project evaluated Boca Raton Fire-Rescue's Smart Heart Community Blood Cholesterol Analysis program, know as "Smart Heart." The problem was Boca Raton Fire-Rescue managers did not know if the Smart Heart participants were making lifestyle changes as a result of the cholesterol analysis program. As a result, managers were unable to determine if the program was improving community health risk as intended. Furthermore, managers were unable to determine if money allocated for the cholesterol analysis program was used effectively. The primary purpose of this research was to determine if the community cholesterol analysis program was achieving its goal of influencing the participant's lifestyle choices by informing them of their blood cholesterol level. A secondary purpose of this research was to solicit suggested improvements from the participants. The research employed an evaluative research technique to answer the following questions: 1) Who are the participants of the Smart Heart cholesterol analysis program, and what are the results of their testing? 2) Are the blood cholesterol analysis program participants making healthier lifestyle changes as a result of the program? 3) Are the program participants identified as having high cholesterol obtaining follow-up care with a physician, and are they successful in reducing their cholesterol level? 4) Can Boca Raton Fire-Rescue improve the Smart Heart blood cholesterol analysis program? This applied research project included a survey in the procedures. The survey was distributed to 419 participants of the free cholesterol analysis event conducted at Boca Raton Fire Station 4, on February 14, 2002. A literature review was also completed to determine what had already been written on the subject.

The results found that 73% of the Smart Heart Blood Cholesterol Analysis participants are over 60 years old. Furthermore, most participants are female and live within the city limits of Boca Raton. More than half of the respondents (55%) indicated they had an above normal cholesterol level, as measure at the Smart Heart event. The results also found that most (74%) of the respondents indicated they did make a lifestyle change as a result of the free cholesterol analysis. The most common lifestyle change was to exercise more. If a respondent's cholesterol level was above normal, the most common lifestyle change was a change in diet. For those with above normal cholesterol levels, the study found that less than half (40%) consult a physician regarding their blood cholesterol. The study also found that while most were successful at reducing their cholesterol level to some degree, only 27% were successful at reducing their blood cholesterol to normal levels. According to the study's respondents, the Smart Heart program can be improved by offering a break down of LDL and HDL cholesterol levels, as well as by offering the cholesterol analysis more often.

Therefore, it was recommended that Boca Raton Fire-Rescue offer the program several times a year. It was also recommended that the Smart Heart program do more to encourage those with high cholesterol to consult with a physician regarding their cholesterol level, and to provide educational opportunities to interested physicians regarding the National Cholesterol Education Program's guidelines. Further recommendations included providing the participants with their LDL and HDL cholesterol levels, as well as conducting additional research.

TABLE OF CONTENTS

INTRODUCTION

Community health programs, for definitions purposes, are those programs designed to promote public health with an emphasis on preventing tragic medical conditions before they occur. Much like fire departments expanded their services to prevent tragic fires in the 1970's, many fire departments in Florida are undertaking community health programs in an effort to prevent tragic emergency medical service (EMS) incidents. The concept is simple. By increasing the community's overall health, and by promoting a healthier lifestyle, the demand for EMS will be reduced or at least maintained.

Boca Raton Fire-Rescue Services, in partnership with Boca Raton Community Hospital, expanded its services to include community health programs in 1994. This unique partnership, known as "Smart Heart," offers free blood cholesterol analysis to the public at local fire stations, and it is one of several programs offered to help improve community health levels. The purpose of the program is to educate the public about their cholesterol level in the hopes they will take proactive steps, such as making healthier lifestyle choices, to reduce cholesterol levels before a heart attack or stroke occurs (Angier, 1997). The cholesterol analysis program has been offered in Boca Raton since 1994, but the program's effectiveness in promoting a healthier lifestyle has never been evaluated.

The problem is Boca Raton Fire-Rescue managers do not know if the Smart Heart participants are making lifestyle changes as a result of the cholesterol analysis program. As a consequence, managers are unable to determine if the program is improving community health risk. Managers, therefore, are also unable to determine if money allocated for the cholesterol analysis program is used effectively, or perhaps should be spent on other community health programs.

The purpose of this research is to determine if the community cholesterol analysis program is achieving its goal of influencing the participant's lifestyle choices by informing them of their blood cholesterol level. A secondary purpose of this research is to solicit suggested improvements to the program from the participants.

This study uses evaluative research methodology and seeks to answer the following questions:

1. Who are the participants of the Smart Heart cholesterol blood analysis program, and what are the results of their testing?
2. Are the blood cholesterol analysis program participants making healthier lifestyle changes as a result of the program?
3. Are the program participants identified as having high cholesterol obtaining follow-up care with a physician, and are they successful in reducing their cholesterol level?
4. Can Boca Raton Fire-Rescue improve the Smart Heart blood cholesterol analysis program?

BACKGROUND AND SIGNIFICANCE

The City of Boca Raton is a municipality located on Florida's southeast coast between West Palm Beach and Fort Lauderdale. Boca Raton's 26 square miles has a population of 75,000 people. The Boca Raton Fire Rescue Services Department is the sole provider of emergency medical services for the community and started advanced life support paramedic services in 1974. The EMS system is comprised of six advanced life support capable fire apparatus, four 24 hour transport capable paramedic rescue units, and two peak hour paramedic rescue units staffed 12 hours a day.

Forming a partnership with Boca Raton Community Hospital in 1994, Boca Raton Fire-Rescue further expanded their role in the community by providing community health outreach programs. The partnership, an innovative public/private relationship, seeks to improve community health care by combining the resources of both agencies and delivering community-based preventive health care programs. The partnership attempts to shift emergency medical services from the reactive state of health care to a proactive role of changing lifestyle risks. As part of this new initiative, the partnership offers free blood cholesterol analysis. The goal of the cholesterol analysis program is to help inform the community of their heart attack risk, thereby allowing participants to make proactive lifestyle changes before a heart attack occurs. Changes can include, increasing exercise activity, altering diet, or consulting a physician in an effort to reduce a participant's blood cholesterol level, thus reducing their chance of a cardiovascular event that requires an EMS response.

Cholesterol analysis is offered at a local fire station in targeted geographic regions in which Boca Raton Fire-Rescue and the hospital believe the risk of heart disease may be most prevalent, typically communities with the highest populations of the elderly. During the program, Boca Raton Fire-Rescue paramedics draw the blood for analysis; the hospital's nurses measure each participant's blood pressure. Paramedics, nurses, and community volunteers also educate the participants about heart disease, and the importance of proper diet and exercise. The hospital's laboratory staff then processes the collected blood, transports it to the hospital for analysis, and mails each participant their cholesterol analysis results. If the participant's

cholesterol level is elevated, the hospital also mails a corresponding letter referring him or her to a Boca Raton Community Hospital affiliated physician. As of February 14, 2002, the Smart Heart partnership has provided free cholesterol analysis to 7, 410 people, according to Boca Raton Community Hospital records.

There has never been a study conducted to evaluate the effectiveness of the blood cholesterol analysis program. Therefore, fire-rescue managers do not have any evidence of the program's success or failure at improving the community's health. It is unknown, currently, how many of the program's participants have taken steps to reduce their blood cholesterol levels as a result of the free cholesterol analysis. Furthermore, of those identified with high cholesterol, it is unknown how many have been successful at reducing their blood cholesterol level.

Past impacts of this problem concern funding for the program. The cost to the partnership to provide the free cholesterol screening each February 14 is in excess of $10,000. For example, according to payroll records, Boca Raton Fire-Rescue spent approximately $4,200.00 to provide the paramedics at the February 14, 2002 cholesterol analysis event. Boca Raton Community Hospital also spent $7,215.00 for the equipment and the laboratory procedures, according to hospital administrators. Because the effectiveness of the program has never been evaluated, managers have expended over $100,000 since 1994 on a program with unknown results.

Boca Raton Fire-Rescue and Boca Raton Community Hospital, through the partnership, plan to continue with the blood cholesterol analysis program. Presently, the impact of the problem is similar to past impacts previously mentioned. Furthermore, because of this problem,

program managers are currently making assumptions about influencing the community health levels without sufficient information.

The allocation of public funds on an unproven program will continue to be an impact of the problem in the future. In addition to not having information on the program's effectiveness, without an evaluation, managers will not know if the participant's expectations are being realized. Therefore, it will be impossible for program managers to determine if improvements or changes to the program are necessary.

This research project is significant to Boca Raton Fire-Rescue for several reasons. The research:

- Analyzes the demographics of the blood cholesterol analysis participants so future program enhancements can be more tailored to their needs.
- Examines if the program is targeting participants within Boca Raton Fire-Rescue's service area and is therefore having an indirect impact on EMS.
- Determines how many of the participants have high cholesterol levels and of those, how many have been successful in reducing blood cholesterol levels.
- Determines if the blood cholesterol analysis program participants are making healthier lifestyle choices as a result of the program.

In summary, the research is meaningful to Boca Raton Fire-Rescue Services because of what can be learned by obtaining information from the program's participants. By identifying whether or not participants are making lifestyle changes as a result of the program, managers can logically determine if the program should be continued as is, discontinued totally, or if improvements can be made. By soliciting suggestions from the participants, managers can also evaluate exactly what program changes may be needed, if any.

The National Fire Academy Strategic Analysis of Community Risk Reduction course requires that each student complete an applied research project within six months of completing the classroom instruction. The Strategic Analysis of Community Risk Reduction class is a component of the National Fire Academy Executive Fire Officer Program. This research is related to the evaluation chapter of the Strategic Analysis of Community Risk Reduction Student Manual. The analysis of the information gathered by this research will help Boca Raton Fire-Rescue Services identify if established education and behavior change interventions are successful in Boca Raton.

LITERATURE REVIEW

The literature review has been divided into two parts. The first is a review of fire service and EMS literature regarding EMS related community outreach programs. The second part is a review of medical literature written about blood cholesterol analysis as a component of health promotion. The purpose of the literature review was to determine what has been written about the subject and identifies existing research on community blood cholesterol analysis and the effectiveness of community health programs. The fire service literature review involved a search of fire service and emergency medical service journals and magazines. The medical literature review involved a search of preventive medicine journals and magazines. Summaries of the sources found to be relevant to this research project are included in this report.

Fire Service and EMS Literature

No journal article was discovered that dealt specifically with an evaluation of EMS related community health programs, although several articles were located that suggested the benefits of such programs to EMS. A few articles made a specific reference to cholesterol analysis programs by an EMS agency.

In an EFO applied research project, Redmond (1998) identified that "The current health care system as we know it is not geared up to address prevention programs" (p.8). Redmond suggests that EMS providers must take proactive measures to reduce mortality in the community. He surveyed EMS and fire personnel to determine, based on their opinion and experiences, which available prevention programs would most benefit the community and reduce EMS responses. According to Redmond's work, EMS and fire personnel indicated they believe blood cholesterol testing was the least beneficial health promotion program out of six choices. Blood pressure screening was considered by the workforce to be the most beneficial.

Hennessy (1998) also identified the need to reduce the number of calls for EMS service through the use of public education and injury prevention/health promotion programs in an EFO applied research paper. Her research attempted to identify an existing program with proven results in reducing EMS responses and found no such program. She also surveyed EMS personnel in an attempt to obtain their opinions on what programs may be successful, as well as conducted expert interviews with managers of successful programs. Although Hennessy's work clearly recommends injury prevention and health promotion programs as a possibility of reducing EMS workload, cholesterol screenings are not mentioned specifically.

In an article by Cady (2000), the author suggests using computer aided dispatch information (CAD) to identify target populations with common health related ailments. Once identified, EMS agencies should develop "population health maintenance strategies" (p.65), as a way of improving community health and reducing EMS call volume. Cady recognizes the need for EMS agencies to "increase their value to the communities they serve through prevention and disease management activities, which in turn will increase the availability and effectiveness for time-sensitive emergencies" (p.76).

Ludwig (2000) compares EMS related community health programs to fire prevention programs undertaken by most fire departments. "In essence, instead of reacting to an emergency medical crisis, many fire departments are trying to prevent emergency medical crisis from even occurring" (p.22). Ludwig provides examples of such programs, including a cardiovascular health-screening program that includes blood cholesterol analysis. He also suggests that the key to such programs is the use of data in determining which programs are needed in the community. No mention is made of an evaluative process for community health programs. The article does suggest, however, that these programs increase an EMS agency's value to the community.

In a second article by Ludwig (1997), community outreach programs are suggested as a way of adding value to EMS agencies in the community. The article focuses on injury and disease prevention, as well as public education activities. Blood pressure screenings are outlined as a disease prevention activity, but cholesterol analysis is not specifically mentioned. Ludwig does identify that all community outreach efforts should be evaluated.

Medical Literature

A search for published literature on preventative health programs revealed an overwhelming amount of resources. For the purpose of simplicity, and to remain within the scope of this research project, reviewed medical literature was limited to only those articles pertaining specifically to cholesterol analysis. The purpose of this literature review is to identify existing research on the effectiveness of blood cholesterol analysis programs in promoting healthier lifestyles.

Williams and Wold (2000), described a research project that studied the impact of mobile, nurse-managed cardiovascular disease-prevention programs at one urban and one rural worksite. The cardiovascular disease-prevention program included cholesterol risk factor profiles. The researchers measured 67 participant's blood cholesterol levels, provided a health risk appraisal, and gauged each participant's stage of behavior change. The intervention objective was to reduce cholesterol through diet and exercise, and included written and oral instructions on suggested diet and exercise behaviors that would reduce cardiovascular risk. Researchers measured the participant's blood cholesterol levels and health risks again one year later. According to Williams and Wold, researchers determined that the rural group had a significant reduction in cholesterol levels, while the urban group did not have a significant change. Furthermore, age, gender, or race did not appear to have a factor in the results. The researchers concluded, therefore, that personal risk identification could be an avenue to educational interventions that may reduce cardiovascular risk.

In a work by Gans, Assmann, Sallar, and Lasater (1999) a study was described that examined cardiovascular disease risk reduction knowledge, including blood cholesterol levels, and how the level of knowledge changed in the participants over time in two communities. The

study conducted six surveys of participants of the Pawtucket Heart Health Program biennially for twelve years, measuring the participant's knowledge of cardiovascular disease. The study concluded that there is an increase in cardiovascular disease knowledge among the participants, mainly from and increase in the identification of physical inactivity and blood cholesterol levels. They also concluded that in order to assure that reductions in cardiovascular disease morbidity and mortality will be sustained, educational efforts must continue. In short, by repeatedly identifying health risk issues, like blood cholesterol levels, over time researchers were successful in increasing the health risk knowledge of the communities.

An article by Turner-Boutle, Sheldon, Smith, and Ebrahim (1998) discusses the evidence of the effectiveness of blood cholesterol screening, cost effectiveness of cholesterol measurement in screening, and treatment of coronary heart disease. Since most coronary heart disease events, according to the article, occur in those without high cholesterol, other risk factors such as smoking, high blood pressure, diabetes, lack of exercise, and obesity should be considered along with blood cholesterol levels when assessing risk. The authors determined that cholesterol screening programs are unlikely to reduce cardiovascular disease mortality and can be misleading. Furthermore, blood cholesterol alone is a poor predictor of risk of cardiovascular disease.

In an article by Strychar, et al. (1998), a research project was described that attempted to identify the impact of receiving blood cholesterol tests on changes in dietary behavior. A group of 500 participants were divided into two groups. Both groups received a 20-minute low intensity education intervention on healthy dietary behaviors, as well as a blood cholesterol test. One half of the group received the results of their cholesterol test and knew their individual cholesterol levels. The second group did not receive their cholesterol levels. A second

cholesterol test was conducted at a post test interview six months later, and both groups received their cholesterol test results. Overall, blood cholesterol levels decreased 4.8 percent. Among participants with normal cholesterol levels, those not receiving blood cholesterol test results during the initial intervention reduced saturated fat intake more than those that received test results. Researchers concluded that cholesterol screening programs should include an assessment of saturated fat intake, as simply screening for blood cholesterol may provide those with normal levels a false sense of security.

An investigation into the cost effectiveness of population-wide educational efforts to reduce serum cholesterol levels was described in an article by Tosteson, et al. (1997). The research utilized computer models and existing data to project costs for cholesterol reduction in the United States from 1995 to 2020, and compared those costs to the costs saved by averting coronary heart disease treatments. Using a their Coronary Heart Disease Policy model, the article suggests educational interventions to lower serum cholesterol are likely to be reasonably cost effective and possibly cost saving over a broad range of assumptions, especially if total serum cholesterol is reduced by two percent or more.

Murdoch and Wilt (1997) attempted to measure physician compliance with the National Cholesterol Education Program's population based guidelines. They surveyed patients who had undergone routine cholesterol analysis to determine if the patients had remembered what their cholesterol level was. The survey was mailed to 250 adults within a year of having their cholesterol analyzed. The patients were asked (1) if they remember if their cholesterol levels were desirable or undesirable, and (2) the actual number. Furthermore, respondents were asked to estimate their perceived level of cardiac risk. Results from the survey were compared to actual laboratory records. Nearly 33 percent did not remember ever having their cholesterol

level checked by a physician's order. Fewer than 20 percent actually knew their cholesterol level, and less than 50 percent with undesirable cholesterol levels had a cholesterol lowering diet recommended. The researchers concluded that compliance with the population-based guidelines is poor, and physicians need to be more diligent in improving patient's awareness of their cholesterol status.

Summary

The fire service literature review established that disease and injury prevention programs are believed to add community value to EMS agencies. Preventative healthcare programs are the next logical progression towards reducing the need for EMS resources, although cholesterol analysis programs have not been written about extensively. Those programs should be targeted towards the community's needs as identified through data collection.

The medical literature review established some contradictions in the value of cholesterol analysis. Some researchers concluded risk identification could be an avenue to reducing cardiovascular risk. Other researchers concluded that blood cholesterol analysis alone is a poor indicator of risk. Several researchers identified the need for cholesterol educational efforts to be repeated in order to be successful in reducing cardiovascular disease.

PROCEDURES

Literature Review

A fire service literature review was conducted during the week of April 8 to April 19, 2002 at the National Fire Academy's Learning Resource Center. The literature review targeted trade journals, magazines, textbooks, and previously written EFOP applied research projects that contained information on fire or EMS based community health programs. The author's personal library was also reviewed for similar information.

A search of the online bibliography hosted by the American Public Health Association was conducted the week of August 3 to August 7, 2002. The search identified specific medical research and literature associated with cholesterol analysis programs. All medical literature was then obtained via interlibrary loan. A survey was conducted to answer the research questions. The survey is detailed here.

Smart Heart Participants Survey

An attempt was made to survey all participants of the Smart Heart cholesterol analysis program conducted at Boca Raton fire station number four on February 14, 2002. The questionnaire was pilot tested on civilian staff members of Boca Raton Fire-Rescue that were known to have participated in the cholesterol analysis program. Minor modifications were made on the final draft. A copy of the survey questionnaire is located in Appendix A. The mailing list was transcribed from the Boca Raton Community Hospital laboratory test forms that each participant filled out during the program. In total, 419 surveys were mailed on August 10, 2002. Respondents had until September 15, 2002 to return the surveys. The postmark on the envelope was used to determine timeliness of the response. Of the 419 surveys mailed, 231 surveys were completed and returned by the deadline. Additionally, 30 surveys were returned by the Post Office as undeliverable. The goal of the survey was to answer the research questions and solicit suggests for improving the program.

Question #1 identified the age of the participant. The four possible responses were; under 20 years old, 21 to 40 years old, 41 to 60 years old, and over 60 years old.

Question #2 asked the participant his or her gender. There were two possible answers, male and female.

Question #3 asked the participant if he or she lived within the municipal limits of the City of Boca Raton.

Question #4 asked the respondent what his or her cholesterol level was, after receiving the results from the Smart Heart Cholesterol Analysis event. Respondents could choose only one of four answers: normal (below 200), above normal (200-300), and very high (over 300). Survey questions #1 through #4 were asked to answer research question #1.

Question #5 asked the respondent if he or she has taken any steps to reduce their blood cholesterol level, since learning of their cholesterol level after the Smart Heart event. Respondents could select all of the answers that applied. Answers included; changed diet, exercise more, saw a physician, started medication, and other. If a respondent choose other, they were asked to please explain. This survey question was asked to answer research question #2.

Question #6 asked the participant if he or she has had their blood cholesterol checked again since the Smart Heart event. Respondents could simply answer yes or no. If the respondent answered yes, he or she was prompted to answer question #7. If the respondent answered no, he or she was prompted to skip to question #8.

Question #7 asked the respondent if he or she has been successful in reducing their blood cholesterol level. Respondents could choose from one of four answers. Those choices being: Yes. My blood cholesterol level is now below 200; Somewhat. My cholesterol level is lower than it was, but is still above 200; No. My blood cholesterol level is still at the same level that it

was at Smart Heart. The final choice was, don't' know. Survey questions #6 and #7 were asked to answer research question #3.

The final survey question, question #8, asked the respondent how Boca Raton Fire-Rescue and Boca Raton Community Hospital could improve the Smart Heart program. This was an opened ended question that allowed the respondent to write in whatever suggestions he or she had to improve the program. This question was asked to answer research question #4.

Assumptions

It is assumed that the authors cited in the literature review conducted unbiased and objective research. It is assumed that all respondents of the Smart Heart participants survey were knowledgeable about their blood cholesterol level and answered all questions honestly.

Limitations

The Smart Heart participants survey is not representative of the entire population of people who received the free blood cholesterol analysis. Although an attempt was made to survey all 677 of the participants who had their cholesterol checked at the February 14, 2002 Smart Heart event, this study was limited to only 419 participants. The survey pool was limited because many of the participants did not fill out the laboratory test order forms, from which the address list was transcribed, with complete mailing addresses. Most were missing key address parts, such as the city, state, or zip code. Also, many of the addresses simply were not legible, and therefore were not surveyed. Furthermore, many of the addresses were known apartment buildings in Boca Raton, but no apartment number was listed. No statistical analysis was made to determine the margin of error in the survey's results.

This study is also limited in scope as to the effectiveness of the Smart Heart program in improving the community's health and the program's ability to affect lifestyle choices. There are other perceived benefits to the program, such as good community interaction and public relations, which were not evaluated in this study. The small amount of fire service or EMS literature written on the subject was also a limitation.

RESULTS

1. Who are the participants of the Smart Heart blood cholesterol analysis program, and what are the results of their testing?

The Smart Heart participants are primarily elderly, with 169 respondents, or 73%, indicating they were over 60 years old. There were 41 (18%) respondents that indicated they were between 41 and 60 years old. There were significantly fewer younger participants. Those ages 21 to 40 were 8.6% percent of the respondents, as indicated with 20 responses. Similarly, there was only one respondent under the age of 20, or .4%.

The majority of the Smart Heart participants are female, as indicated with 131 responses (57%). Respondents indicating they were male numbered 100, or 43%.

Over half the respondents indicated they lived within the municipal limits of the City of Boca Raton, as indicated by 155 respondents, or 67%. Conversely, 76 respondents (33%) indicated they did not live within the municipal limits of the City of Boca Raton.

The largest group of respondents, 127 (55%), indicated their blood cholesterol level was above normal with a total value between 200 and 300. A smaller amount of respondents, 100 or 43%, indicated their cholesterol level was normal with a total value less than 200. There were only two respondents (.9%) that indicated their total cholesterol level was very high, with a total level over 300. Also, two respondents did not recall their total cholesterol level. As indicated in

Table 1, a larger percentage of females (67%) that indicated they had an above normal cholesterol level than males (39%).

Table 1.

Cholesterol Results by Sex

	Total Cholesterol Level			
	Less than 200	200 to 300	Over 300	Don't know
Smart Heart Participant Sex				
Male	61 (61%)	39 (39%)	0 (0%)	0 (0%)
Female	39 (30%)	88 (67%)	2 (1.5%)	2 (1.5%)

2. Are the blood cholesterol analysis program participants making healthier lifestyle changes as a result of the program?

Almost three quarters (171 or 74%) the participants that responded to the survey indicated that they have taken steps to reduce their cholesterol levels. Only 60 of the 231 respondents indicated that they did not take any steps to reduce their cholesterol level since the Smart Heart event. The most common response was exercise more, with 98 responses (42%). There were 85 respondents, or 37%, that indicated they changed their diet since learning of their cholesterol level at Smart Heart. Those that indicated they visited a physician since learning of their cholesterol level numbered 63 (27%). Furthermore, 33 respondents, or 14%, indicated they started taking medication to reduce their cholesterol level since learning of their cholesterol level at Smart Heart. Only 12% indicated they took some other step to reduce their cholesterol level, with 28 responses.

Table 2.

Lifestyle Changes by Cholesterol Level

	Lifestyle Change				
	Exercise More	Changed Diet	Saw Physician	Started Meds.	Other
Cholesterol Level					
Below 200	19 (20%)	31 (33%)	12(13%)	7 (7.3%)	4 (4.2%)
200-300	63 (49%)	65 (51%)	50 (39%)	24 (19%)	8 (6%)
Over 300	1 (50%)	0 (0%)	2 (100%)	1 (50%)	0 (0%)

The percentages of the respondents taking steps to reduce their cholesterol level are higher when those identified as having an above normal or very high cholesterol level are evaluated separately from the entire survey population, as demonstrated in Table 2. As such, 96% of those with high cholesterol claim to have taken some steps to reduce their cholesterol level since the Smart Heart event. Only six of 130 respondents indicated they did not take any steps to reduce their cholesterol level. The most common cholesterol-reducing step was to change diet, with 65 responses, or 50%. There were 64 (49%) respondents that indicated they exercise more. Those that consulted a physician to reduce their cholesterol level numbered 52, or 40%. Additionally, 25 respondents, or 19%, with above normal or very high cholesterol started medication to reduce cholesterol levels. Fewer respondents, eight (6%) indicated “other” as a step to reducing cholesterol levels. The most common explanation noted on the survey form

was that the respondent was simply maintaining a diet, exercise, or medication regiment established before the Smart Heart event.

3. Are the program participants identified as having high cholesterol obtaining follow-up care with a physician, and are they successful in reducing their cholesterol level?

Of 130 respondents that indicated they had an above normal or very high cholesterol level after receiving the results from the Smart Heart event, 52, or 40%, indicated they saw a physician in an attempt to lower their cholesterol level. Conversely, 60% of the respondents with above normal or very high cholesterol levels (78) did not seek a physician's attention.

There were 79 (61%) respondents of the 130 that indicated that had above normal or very high cholesterol levels that indicated they have since had their cholesterol checked again since the Smart Heart event. Since 51 respondents identified as having high cholesterol indicated they have not had their cholesterol level checked again since Smart Heart, only 79 of the original 130 respondents were evaluated to determine if they were successful in reducing total blood cholesterol level. Those respondents that indicated yes, they were successful in lowering cholesterol levels, and their blood cholesterol level was now below 200 numbered 21, or 27%. Over half indicated they were successful in reducing their blood cholesterol somewhat, 45 respondents or 57%, but it was still above 200. Only 12 respondents (15%) indicated they were unsuccessful in lowering their cholesterol, and their cholesterol level is still the same as it was at Smart Heart. Just one respondent indicated he or she didn't know what their cholesterol level was after it was re-checked.

Of the 21 respondents that indicated they were successful at reducing their cholesterol below 200, 12 (57%) also indicated they saw a physician. Also, of the 45 respondents that indicated they were somewhat successful, meaning their cholesterol level was lower than at Smart Heart, but is still above 200, 28 (62%) indicated they consulted a physician. Half of the 12 respondents that indicated they were unsuccessful at reducing their cholesterol levels (six or 50%) indicated they also saw a physician.

4. Can Boca Raton Fire-Rescue improve the Smart Heart blood cholesterol analysis program?

Most respondents did not offer any suggestions for improving the Smart Heart Cholesterol Analysis program; they used the space on the questionnaire to express accolades about the program and the Boca Raton Fire-Rescue Services. However, the most common suggestion for improving the Smart Heart Cholesterol Analysis program was to provide a break down of HDL and LDL cholesterol levels, with 15 responses. There were 14 suggestions for improving the program by offering the cholesterol analysis more often than once a year. A few respondents, five, suggested that more advertising would improve the program. Additionally, three respondents thought that more information about fasting versus non-fasting cholesterol tests should be provided. Smart Heart sponsored exercise programs were suggested by three respondents as a way of improving the program. With one respondent suggesting each, other suggestions included: providing more people to help people fill out the necessary paperwork; providing menu examples for healthy eating; adding diabetes screening tests; adding a prostrate cancer screening test (PSA) for men; providing more information on reducing cholesterol levels; and using better equipment to check blood pressures.

DISCUSSION

It can be determined from the survey that most (74%) of those that participated in the Smart Heart blood cholesterol analysis program are at least making some effort to reduce their cholesterol level. Furthermore, it can be determined that 96% of those participants identified with high cholesterol made some lifestyle change to improve their total cholesterol level. These results are consistent with the works by Williams and Wold (2000) and Gans et al. (1999). Both articles suggest that identifying risk factors for cardiovascular disease may prompt participants to take interventions that reduce risk. However, this study's results are contrary to works by Strychar et al. (1998) and Turner-Boutle et al. (1998). Both articles imply that simply providing someone with their cholesterol level alone may be misleading in terms of identifying one's risk for cardiovascular disease and may lead a false sense of security.

According to the survey results, 85% of those identified with high cholesterol and had their cholesterol level re-check since Smart Heart were successful at reducing their blood cholesterol level to some degree. Since the City of Boca Raton is primarily an urban area, the survey results are also contradicted by the work by Williams and Wold (2000). In their study, members of the urban group did not have a significant change in blood cholesterol levels.

Murdoch and Wilt (1997) concluded that less than 20% of adults did not remember their cholesterol level within a year of being tested. The survey results suggest otherwise. In all but two returned surveys, the participant at least remembered the category in which their cholesterol level fell, normal, above normal, or very high. Furthermore, many surveys were returned with the specific cholesterol number written in by the respondent.

Several studies reviewed, Gans et al. (1999) and Murdoch and Wilt (1997), identified the need for sustained educational efforts and repeated cholesterol testing to improve a patient's awareness of their cholesterol status. The survey results support these findings, since 39% of those with high cholesterol never had their cholesterol level re-checked after making lifestyle changes to reduce their cholesterol level. Furthermore, only 40% of those identified with high cholesterol visited a physician concerning their cholesterol level. Although most participants are making an effort to reduce their cholesterol level, the small amount of participants that see a physician or confirm their efforts are working with a second analysis was a surprise result of the survey.

Murdoch and Wilt (1997) also determined that compliance with National Cholesterol Education Program's guidelines was poor, and physicians need to be more diligent in improving patient's awareness of their cholesterol status. This conclusion appears to be supported by the Smart Heart survey, since there does not appear to be a correlation between a participant's ability to reduce their cholesterol level and whether or not they consulted a physician. The survey determined that roughly half of participants successful in reducing cholesterol levels consulted a physician, irrespective of their initial cholesterol level.

Although not specifically measured in the survey results, it can be implied from the survey that the Smart Heart Community Blood Cholesterol Analysis program has increased Boca Raton Fire-Rescue's value to the community, as suggested in works by Ludwig (1997), Ludwig (2000), and Cady (2000). This implication is based on the overwhelming, unsolicited, and anonymous comments received on the surveys in support of Smart Heart and Boca Raton Fire-Rescue Services.

Redmond (1998) determined that cholesterol screenings would be the least beneficial prevention program, according to the EMS personnel in his community. The results of the Smart Heart survey suggest blood cholesterol analysis is a much more beneficial community health program, based on the large amount of participants (74%) that indicated they made lifestyle changes in attempt to reduce cardiovascular risk after receiving their results from Smart Heart event.

All of the authors of the fire service literature, Redmond (1998), Hennessy (1998), Ludwig (1997), Ludwig (2000), and Cady (2000) identified community health programs as a way of reducing EMS responses by proactively preventing medical crisis. This concept makes sense. However, the Smart Heart survey does not support or contradict this conclusion. Although the survey results do suggest Smart Heart is successful in improving community health, it is impossible to predict how many EMS calls have actually been prevented, if any.

Interpretations of the study indicate that the average Heart Smart participant is female, over 60 years old, and lives within the municipal limits of the City of Boca Raton. Furthermore, most Smart Heart participants have blood cholesterol level of between 200 and 300. These study interpretations suggest that the Smart Heart Blood Cholesterol Analysis is successful in reaching the appropriate target population.

It can also be interpreted from the study that most participants of Smart Heart are making some lifestyle changes as a result of the program. The most common lifestyle change undertaken by participants is to increase their level of exercise. However, if the participant has been identified as having a cholesterol level above 200, the most common lifestyle change is to change their diet. Based on these findings, it appears the Smart Heart Blood Cholesterol

Analysis program is accomplishing the goal of influencing the participants to make healthier lifestyle changes.

Less than half of the Smart Heart participants identified with high cholesterol contact a physician concerning their cholesterol level, as determined from the study. Furthermore, only slightly more than a third of the participants with above normal cholesterol levels ever receive a second cholesterol analysis to determine if their efforts to reduce cholesterol levels are successful. It can be interpreted, therefore, that the Smart Heart program needs to be improved in this area and must encourage more participants with high cholesterol to consult with a physician and obtain a additional cholesterol analysis.

Despite that the study suggests that Smart Heart is reaching its target audience, and the program is affecting healthier lifestyle changes, it can also be interpreted from the study that the Smart Heart cholesterol analysis program is only marginally effective at reducing the participant's cholesterol to normal levels. As a basis for this interpretation, only 27% of those identified with high cholesterol, and have since had their cholesterol rechecked, were successful at reducing their blood cholesterol to below 200.

The findings of this survey have organizational implications to Boca Raton Fire-Rescue Services. The study shows Smart Heart is achieving its goal of influencing the community by affecting a healthier lifestyle. The program, furthermore, is reaching mostly City of Boca Raton residents, so it can be assumed (but not proven) that there are indirect benefits to the city's EMS system in terms of a reduction in medical crisis within the target population of the Smart Heart program. Armed with this information, Fire-Rescue managers, and Boca Raton Community Hospital administrators can be confident that the expense of the cholesterol analysis program in

the past was justified. Additionally, managers and administrators can allocate future funding to maintain the program, or expand it, with the knowledge of the program's effectiveness.

RECOMMENDATIONS

Research suggests that the program can be more effective if those with high cholesterol are given an opportunity to be retested. It is recommended, therefore, that the Smart Heart Community Blood Cholesterol Analysis program be expanded to several times a year. Furthermore, it is also recommended that the Smart Heart partnership mail invitations to those previously identified as having above normal cholesterol levels to future Smart Heart cholesterol analysis events.

It is recommended that the Smart Heart partnership do more to encourage those with high cholesterol levels to consult with a physician. The partnership should consider sending a second physician referral letter to those with high cholesterol, or contacting them by telephone a month or so after the participant's results have been mailed. It is also recommended that the partnership provided educational opportunities to the physicians that Smart Heart participants are referred to in an effort to gain greater compliance with the National Cholesterol Education Program's guidelines.

In an effort to improve the Smart Heart participant's satisfaction, it is recommended that the Smart Heart partnership consider offering a cholesterol analysis that includes LDL (bad) and HDL (good) cholesterol levels.

It is recommended that additional research be conducted to determine exactly why so few participants identified as having high cholesterol are not being successful at reducing cholesterol levels to below 200.

It is recommended that additional research be conducted to determine if the Smart Heart Community Cholesterol Analysis program is having an impact on the EMS system in Boca Raton. The research should be focused on using both hospital data and Boca Raton Fire-Rescue data to determine if the actual number of cardiac related EMS responses per capita has decreased in the program's target area.

REFERENCE LIST

Angier, B.D., (1997, July). Community health partnership prepares Boca Raton's EMS system for the future. *Fire Engineering,* 150, 94-100.

Cady, G.A., (2000, September/October). Community outreach: A new model for EMS. *9-1-1 Magazine*. 13, 65-77.

Gans, K.M., Assmann, S.F., Sallar, A., Lasater, T.M., (1999). Knowledge of cardiovascular disease prevention: An analysis from two New England communities. *Preventive Medicine,* 29, 229-237.

Hennessy, M.T., (1998). *Gaining community support by reducing requests for emergency medical services* (Executive Fire Officer Research Paper). Emmitsburgh, MD: National Fire Academy.

Ludwig, G.G., (1997, September/October). Community oriented EMS. *9-1-1 Magazine*. 10, 56-57.

Ludwig, G.G., (2000, December). A new paradigm: Community outreach prevention programs. *Firehouse*. 25, 22.

Murdoch, M., Wilt, T.J., (1997). Cholesterol awareness after case-finding: Do patients really know their cholesterol numbers? *American Journal of Preventive Medicine*, 13, 284-289.

Redmond, H.W., (1998). *Implementation of an EMS prevention program for the City of Lake Worth Fire Rescue Department* (Executive Fire Officer Research Paper). Emmitsburgh, MD: National Fire Academy.

Strychar, L.M., Champagne, F., Ghadirian, P., Bonin, A., Jenicek, M., Lasater, T.M., (1998). Impact of receiving blood cholesterol test results on dietary change. *American Journal of Preventive Medicine,* 14, 103-110.

Tosteson, A., Weinstein, M.C., Hunink, M., Mittleman, M.A., Williams, L.W., Goldman, P.A., Goldman, L., (1997). Cost-effectiveness of populationwide educational approaches to reduce serum cholesterol levels. *Circulation,* 95, 24-30.

Turner-Boutle, M., Sheldon, T., Smith, G.D., Ebrahim, S., (1998). Cholesterol and coronary heart disease: Screening and treatment. *Nursing Times,* 94, 46-47.

Williams, A., Wold, J., (2000). Nurses, cholesterol, and small work sites: Innovative community intervention. *Family and Community Health*, 23, 59-75.

Appendix A

Appendix A is a reduced copy of the survey questionnaire

Smart Heart Cholesterol Analysis Survey Questionnaire

1) What is your age? (please select only one answer)
   a) Under 20 years old
   b) 21 to 40 years old
   c) 41 to 60 years old
   d) Over 60 years old

2) What is your gender? (please select only one answer)
   a) Male
   b) Female

3) Do you reside within the municipal limits of the City of Boca Raton? (please select only one answer)
   a) Yes
   b) No

4) After receiving your cholesterol analysis results from the Smart Heart Cholesterol Analysis event, what was your cholesterol level? (please select only one answer)
   a) Normal (below 200)
   b) Above normal (200-300)
   c) Very high (over 300)

5) Since learning of your blood cholesterol level from the Smart Heart event, have you taken any of the following steps to reduce your blood cholesterol level? (please select all that apply)
   a) Changed diet
   b) Exercise more
   c) Saw a physician
   d) Started medication
   e) Other_____(please explain)

6) Since the Smart Heart event, have you had your blood cholesterol levels check again?
   a) Yes
   b) No

If you answered "yes", please continue to question 7. If you answered "no", please skip to question 8.

7) Have you been successful in reducing your blood cholesterol level since Smart Heart?
   a) Yes. My blood cholesterol level is now below 200.
   b) Somewhat. My blood cholesterol level is lower that it was, but it is still above 200.
   c) No. My blood cholesterol level is still at the same level that it was at Smart Heart.
   d) Don't know.

8) What can Boca Raton Fire-Rescue Services and Boca Raton Community Hospital do to improve the Smart Heart Community Blood Cholesterol Analysis Program?

_____
_____
_____
_____
_____

Thank you completing this survey. Please feel free to include additional comments on the reverse side.

PLEASE RETURN BY **SEPTEMBER 15, 2002** TO:
BATTALION CHIEF BRUCE ANGIER
BOCA RATON FIRE-RESCUE SERVICES
2333 W. GLADES ROAD, BOCA RATON, FL 33487